SEQUENCE LISTING

<110> Dahlquist, Anders
      Stahl, Ulf
      Lenman, Marit
      Banas, Antoni
      Ronne, Hans

<120> A new class of enzymes in the biosynthetic pathway for the production of triacylglycerol and recombinant DNA molecules encoding these enzymes

<130> BASFnae337799PCT1-15

<140> US 09/537,710

<141> 2000-03-30

<150> EP 99106656.4
<151> 1999-04-01

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Leu Pro Gln Gly Ile Ser Ser Phe Ile Asp Asp Ile Gln Ala Gly Asn
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Ser Glu Asp Ala Leu Asn Asn Asn Thr Asp Thr Tyr Gly Asn Phe Ile
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gcg gag ttg aac gat tac atc ttg aaa att gca agc ggt aat ggc gat    1920
Ala Glu Leu Asn Asp Tyr Ile Leu Lys Ile Ala Ser Gly Asn Gly Asp
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Ile Ser Gly Ser Ala Lys Arg Asn Glu Arg Gly Lys Asp Phe Asp Arg
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Lys Arg Asp Gly Asn Gly Arg Lys Arg Trp Arg Asp Ser Arg Arg Leu
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Ile Phe Ile Leu Gly Ala Phe Leu Gly Val Leu Leu Pro Phe Ser Phe
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Val Asn Phe Asp Ser Leu Lys Val Tyr Leu Asp Asp Trp Lys Asp Val
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Gly Ser Phe Tyr Met Leu Arg Thr Met Val Met Asp Lys Val Cys Trp
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Ala Tyr Leu Asp Leu Glu Arg Arg Asp Arg Tyr Phe Thr Lys Leu Lys
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Glu Gln Ile Glu Leu Phe His Gln Leu Ser Gly Glu Lys Val Cys Leu
305             310             315             320

Ile Gly His Ser Met Gly Ser Gln Ile Ile Phe Tyr Phe Met Lys Trp
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Ile Gln Leu Asn Thr Leu Ala Met Tyr Gly Leu Glu Lys Phe Phe Ser
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Arg Ile Glu Arg Val Lys Met Leu Gln Thr Trp Gly Gly Ile Pro Ser
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Glu Leu Arg Lys Asn Glu Leu His His Lys His Trp Ser Asn Pro Met
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Glu Val Pro Leu Pro Glu Ala Pro His Met Lys Ile Tyr Cys Ile Tyr
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Asp Ser Ser Ala Leu Asn Leu Thr Ile Asp Tyr Glu Ser Lys Gln Pro
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Val Phe Leu Thr Glu Gly Asp Gly Thr Val Pro Leu Val Ala His Ser
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Met Cys His Lys Trp Ala Gln Gly Ala Ser Pro Tyr Asn Pro Ala Gly
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Ile Asn Val Thr Ile Val Glu Met Lys His Gln Pro Asp Arg Phe Asp
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Ile Arg Gly Gly Ala Lys Ser Ala Glu His Val Asp Ile Leu Gly Ser
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Ala Glu Leu Asn Asp Tyr Ile Leu Lys Ile Ala Ser Gly Asn Gly Asp
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<213> Arabidopsis thaliana

<400> 6

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Glu Ser Ser Lys Ser His His Lys Lys Ser Asn Gly Gly Gly Lys Trp
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Ser Cys Ile Asp Ser Cys Cys Trp Phe Ile Gly Cys Val Cys Val Thr
     50                  55                  60

Trp Trp Phe Leu Leu Phe Leu Tyr Asn Ala Met Pro Ala Ser Phe Pro
 65                  70                  75                  80

Gln Tyr Val Thr Glu Arg Ile Thr Gly Pro Leu Pro Asp Pro Pro Gly
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Val Lys Leu Lys Lys Glu Gly Leu Lys Ala Lys His Pro Val Val Phe
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Ile Pro Gly Ile Val Thr Gly Gly Leu Glu Leu Trp Glu Gly Lys Gln
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Cys Ala Asp Gly Leu Phe Arg Lys Arg Leu Trp Gly Gly Thr Phe Gly
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Glu Val Tyr Lys Arg Pro Leu Cys Trp Val Glu His Met Ser Leu Asp
145                 150                 155                 160

Asn Glu Thr Gly Leu Asp Pro Ala Gly Ile Arg Val Arg Ala Val Ser
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Gly Leu Val Ala Ala Asp Tyr Phe Ala Pro Gly Tyr Phe Val Trp Ala
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Val Leu Ile Ala Asn Leu Ala His Ile Gly Tyr Glu Glu Lys Asn Met
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Tyr Met Ala Ala Tyr Asp Trp Arg Leu Ser Phe Gln Asn Thr Glu Val
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Arg Asp Gln Thr Leu Ser Arg Met Lys Ser Asn Ile Glu Leu Met Val
225                 230                 235                 240

Ser Thr Asn Gly Gly Lys Lys Ala Val Ile Val Pro His Ser Met Gly
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Val Leu Tyr Phe Leu His Phe Met Lys Trp Val Glu Ala Pro Ala Pro
            260                 265                 270

Leu Gly Gly Gly Gly Gly Pro Asp Trp Cys Ala Lys Tyr Ile Lys Ala
            275                 280                 285

Val Met Asn Ile Gly Gly Pro Phe Leu Gly Val Pro Lys Ala Val Ala
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Gly Leu Phe Ser Ala Glu Ala Lys Asp Val Ala Val Ala Arg Ala Ile
305                 310                 315                 320

Ala Pro Gly Phe Leu Asp Thr Asp Ile Phe Arg Leu Gln Thr Leu Gln
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His Val Met Arg Met Thr Arg Thr Trp Asp Ser Thr Met Ser Met Leu
            340                 345                 350

Pro Lys Gly Gly Asp Thr Ile Trp Gly Gly Leu Asp Trp Ser Pro Glu
            355                 360                 365

Lys Gly His Thr Cys Cys Gly Lys Lys Gln Lys Asn Asn Glu Thr Cys
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Gly Glu Ala Gly Glu Asn Gly Val Ser Lys Lys Ser Pro Val Asn Tyr
385                 390                 395                 400
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Pro Asn His Thr Cys Arg Asp Val Trp Thr Glu Tyr His Asp Met Gly
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Ile Ala Gly Ile Lys Ala Ile Ala Glu Tyr Lys Val Tyr Thr Ala Gly
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Glu Ala Ile Asp Leu Leu His Tyr Val Ala Pro Lys Met Met Ala Arg
465             470             475             480

Gly Ala Ala His Phe Ser Tyr Gly Ile Ala Asp Asp Leu Asp Asp Thr
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Lys Tyr Gln Asp Pro Lys Tyr Trp Ser Asn Pro Leu Glu Thr Lys Leu
            500             505             510

Pro Asn Ala Pro Glu Met Glu Ile Tyr Ser Leu Tyr Gly Val Gly Ile
            515             520             525

Pro Thr Glu Arg Ala Tyr Val Tyr Lys Leu Asn Gln Ser Pro Asp Ser
    530             535             540

Cys Ile Pro Phe Gln Ile Phe Thr Ser Ala His Glu Glu Asp Glu Asp
545             550             555             560

Ser Cys Leu Lys Ala Gly Val Tyr Asn Val Asp Gly Asp Glu Thr Val
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Pro Val Leu Ser Ala Gly Tyr Met Cys Ala Lys Ala Trp Arg Gly Lys
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Thr Arg Phe Asn Pro Ser Gly Ile Lys Thr Tyr Ile Arg Glu Tyr Asn
            595             600             605

His Ser Pro Pro Ala Asn Leu Leu Glu Gly Arg Gly Thr Gln Ser Gly
    610             615             620

Ala His Val Asp Ile Met Gly Asn Phe Ala Leu Ile Glu Asp Ile Met
625             630             635             640

Arg Val Ala Ala Gly Gly Asn Gly Ser Asp Ile Gly His Asp Gln Val
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His Ser Gly Ile Phe Glu Trp Ser Glu Arg Ile Asp Leu Lys Leu
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<213> Zea mays

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<223> n= a or g or c or t/u
<221> Unsure
<222> 1...643
<223> Xaa = unknown

<400> 7

| cgg | gag | aaa | ata | gct | gct | ttg | aag | ggg | ggt | gtt | tac | tta | gcc | gat | ggt | 48 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Arg | Glu | Lys | Ile | Ala | Ala | Leu | Lys | Gly | Gly | Val | Tyr | Leu | Ala | Asp | Gly | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |

| gat | gaa | act | gtt | cca | gtt | ctt | agt | gcg | ggc | tac | atg | tgt | gcg | aaa | gga | 96 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Asp | Glu | Thr | Val | Pro | Val | Leu | Ser | Ala | Gly | Tyr | Met | Cys | Ala | Lys | Gly | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |

| tgg | cgt | ggc | aaa | act | cgt | ttc | agc | cct | gcc | ggc | agc | aag | act | tac | gtg | 144 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Trp | Arg | Gly | Lys | Thr | Arg | Phe | Ser | Pro | Ala | Gly | Ser | Lys | Thr | Tyr | Val | |
| | 35 | | | | | 40 | | | | | 45 | | | | | |

| aga | gaa | tac | agc | cat | tcg | cca | ccc | tct | act | ctc | ctg | gaa | ggc | agg | ggc | 192 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Glu | Tyr | Ser | His | Ser | Pro | Pro | Ser | Thr | Leu | Leu | Glu | Gly | Arg | Gly | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |

| acc | cag | agc | ggt | gca | cat | gtt | gat | ata | atg | ggg | aac | ttt | gct | cta | att | 240 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Gln | Ser | Gly | Ala | His | Val | Asp | Ile | Met | Gly | Asn | Phe | Ala | Leu | Ile | |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 | |

| gag | gac | gtc | atc | aga | ata | gct | gct | ggg | gca | acc | ggt | gag | gaa | att | ggt | 288 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Asp | Val | Ile | Arg | Ile | Ala | Ala | Gly | Ala | Thr | Gly | Glu | Glu | Ile | Gly | |
| | | | 85 | | | | | 90 | | | | | 95 | | | |

| ggc | gat | cag | gtt | tat | tca | gat | ata | ttc | aag | tgg | tca | gag | aaa | atc | aaa | 336 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Asp | Gln | Val | Tyr | Ser | Asp | Ile | Phe | Lys | Trp | Ser | Glu | Lys | Ile | Lys | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |

| ttg | aaa | ttg | taa | cct | atg | gga | agt | taa | aga | agt | gcc | gac | ccg | ttt | att | 384 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Lys | Leu | Xaa | Pro | Met | Gly | Ser | Xaa | Arg | Ser | Ala | Asp | Pro | Phe | Ile | |
| | | 115 | | | | | 120 | | | | | 125 | | | | |

| gcg | ttc | caa | agt | gtc | ctg | cctgagtgca | actctggatt | ttgcttaaat | 432 |
|-----|-----|-----|-----|-----|-----|------------|------------|------------|-----|
| Ala | Phe | Gln | Ser | Val | Leu | | | | |
| | 130 | | | | | | | | |

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<212> PRT
<213> Zea mays

<400> 8

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            20              25              30

Trp Arg Gly Lys Thr Arg Phe Ser Pro Ala Gly Ser Lys Thr Tyr Val
        35              40              45

Arg Glu Tyr Ser His Ser Pro Pro Ser Thr Leu Leu Glu Gly Arg Gly
    50              55              60

Thr Gln Ser Gly Ala His Val Asp Ile Met Gly Asn Phe Ala Leu Ile
 65             70              75                      80

Glu Asp Val Ile Arg Ile Ala Ala Gly Ala Thr Gly Glu Glu Ile Gly
                85              90              95

Gly Asp Gln Val Tyr Ser Asp Ile Phe Lys Trp Ser Glu Lys Ile Lys
            100             105             110

Leu Lys Leu
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<212> DNA
<213> Arabidopsis thaliana

<400> 10

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<213> Arabidopsis thaliana

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tcatagctaa catgacaaaa gcaccaaggg ttaagtacat aacctttat gaagactctg 3840
agagcattcc ggggaagaga accgcagtct gggagcttga taaaagtggg tattaa    3896
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<210> 12
<211> 709
<212> DNA
<213> Lycopersicon esculentum

<400> 12
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ctggggccaa aagtgaacat aacaaggaca ccacagtcag agcatgatgt tcagatgtac 60
aagtgcatct aaatatagag catcaacatg gtgaagatat cattcccaat atgacaaagt 120
tacctacaat gaagtacata acctattatg aggattctga aagttttcca gggacaagaa 180
cagcagtttg ggagcttgat aaagcaaatc acaggaacat tgtcagatct ccagctttga 240
tgcgggagct gtggcttgag atgtggcatg atattcatcc tgataaaaag tccaagtttg 300
ttacaaaagg tggtgtctga tcctcactat tttcttctat aaatgtttga gtttgtattg 360
acattgtaag tattgcaaca aaaagcaaag cgtgggcctc tgagggatga ggactgctat 420
tgggattacg ggaaagctcg atgtgcatgg ctgaacatt gtgaatacag gttagaatat 480
tcaaattata ttttgcaaaa tattctcttt ttgtgtattt aggccacctt ccccggtca 540
caacgatgca gatatgtatt cggggatgtt cacctgggac agagttgcag attgaagagt 600
```

tctacatctc acatcctgtc acactatgtg tgatatttaa gaaactttgt ttggcggaac 660
aacaagtttg cacaaacatt tgaagaagaa agcgaaatga ttcagagag          709


<210> 13
<211> 623
<212> PRT
<213> Schizosaccharomyces pombe

<400> 13
Met Ala Ser Ser Lys Lys Ser Lys Thr His Lys Lys Lys Lys Glu Val
 1               5                  10                  15

Lys Ser Pro Ile Asp Leu Pro Asn Ser Lys Lys Pro Thr Arg Ala Leu
            20                  25                  30

Ser Glu Gln Pro Ser Ala Ser Glu Thr Gln Ser Val Ser Asn Lys Ser
         35                  40                  45

Arg Lys Ser Lys Phe Gly Lys Arg Leu Asn Phe Ile Leu Gly Ala Ile
      50                  55                  60

Leu Gly Ile Cys Gly Ala Phe Phe Phe Ala Val Gly Asp Asp Asn Ala
 65               70                  75                  80

Val Phe Asp Pro Ala Thr Leu Asp Lys Phe Gly Asn Met Leu Gly Ser
            85                  90                  95

Ser Asp Leu Phe Asp Asp Ile Lys Gly Tyr Leu Ser Tyr Asn Val Phe
            100                 105                 110

Lys Asp Ala Pro Phe Thr Thr Asp Lys Pro Ser Gln Ser Pro Ser Gly
            115                 120                 125

Asn Glu Val Gln Val Gly Leu Asp Met Tyr Asn Glu Gly Tyr Arg Ser
         130                 135                 140

Asp His Pro Val Ile Met Val Pro Gly Val Ile Ser Ser Gly Leu Glu
145                 150                 155                 160

Ser Trp Ser Phe Asn Asn Cys Ser Ile Pro Tyr Phe Arg Lys Arg Leu
                165                 170                 175

Trp Gly Ser Trp Ser Met Leu Lys Ala Met Phe Leu Asp Lys Gln Cys
            180                 185                 190

Trp Leu Glu His Leu Met Leu Asp Lys Lys Thr Gly Leu Asp Pro Lys
         195                 200                 205

Gly Ile Lys Leu Arg Ala Ala Gln Gly Phe Glu Ala Ala Asp Phe Phe
      210                 215                 220

Ile Thr Gly Tyr Trp Ile Trp Ser Lys Val Ile Glu Asn Leu Ala Ala
225                 230                 235                 240

Ile Gly Tyr Glu Pro Asn Asn Met Leu Ser Ala Ser Tyr Asp Trp Arg
            245                 250                 255

Leu Ser Tyr Ala Asn Leu Glu Glu Arg Asp Lys Tyr Phe Ser Lys Leu

```
                260                      265                     270

Lys Met Phe Ile Glu Tyr Ser Asn Ile Val His Lys Lys Lys Val Val
        275             280             285

Leu Ile Ser His Ser Met Gly Ser Gln Val Thr Tyr Tyr Phe Phe Lys
    290             295             300

Trp Val Glu Ala Glu Gly Tyr Gly Asn Gly Gly Pro Thr Trp Val Asn
305             310             315                     320

Asp His Ile Glu Ala Phe Ile Asn Ile Ser Gly Ser Leu Ile Gly Ala
            325             330             335

Pro Lys Thr Val Ala Ala Leu Leu Ser Gly Glu Met Lys Asp Thr Gly
            340             345             350

Ile Val Ile Thr Leu Asn Ile Leu Glu Lys Phe Phe Ser Arg Ser Glu
            355             360             365

Arg Ala Met Met Val Arg Thr Met Gly Gly Val Ser Ser Met Leu Pro
    370             375             380

Lys Gly Gly Asp Val Ala Pro Asp Asp Leu Asn Gln Thr Asn Phe Ser
385             390             395                     400

Asn Gly Ala Ile Ile Arg Tyr Arg Glu Asp Ile Asp Lys Asp His Asp
            405             410             415

Glu Phe Asp Ile Asp Asp Ala Leu Gln Phe Leu Lys Asn Val Thr Asp
            420             425             430

Asp Asp Phe Lys Val Met Leu Ala Lys Asn Tyr Ser His Gly Leu Ala
            435             440             445

Trp Thr Glu Lys Glu Val Leu Lys Asn Asn Glu Met Pro Ser Lys Trp
    450             455             460

Ile Asn Pro Leu Glu Thr Ser Leu Pro Tyr Ala Pro Asp Met Lys Ile
465             470             475             480

Tyr Cys Val His Gly Val Gly Lys Pro Thr Glu Arg Gly Tyr Tyr Tyr
            485             490             495

Thr Asn Asn Pro Glu Gly Gln Pro Val Ile Asp Ser Ser Val Asn Asp
            500             505             510

Gly Thr Lys Val Glu Asn Gly Ile Val Met Asp Asp Gly Asp Gly Thr
            515             520             525

Leu Pro Ile Leu Ala Leu Gly Leu Val Cys Asn Lys Val Trp Gln Thr
    530             535             540

Lys Arg Phe Asn Pro Ala Asn Thr Ser Ile Thr Asn Tyr Glu Ile Lys
545             550             555             560

His Glu Pro Ala Ala Phe Asp Leu Arg Gly Gly Pro Arg Ser Ala Glu
            565             570             575
```

His Val Asp Ile Leu Gly His Ser Glu Leu Asn Glu Ile Ile Leu Lys
       580           585           590

Val Ser Ser Gly His Gly Asp Ser Val Pro Asn Arg Tyr Ile Ser Asp
     595          600          605

Ile Gln Glu Ile Ile Asn Glu Ile Asn Leu Asp Lys Pro Arg Asn
   610          615        620


<210> 14
<211> 432
<212> PRT
<213> Arabidopsis thaliana

<400> 14
Met Lys Lys Ile Ser Ser His Tyr Ser Val Val Ile Ala Ile Leu Val
  1          5          10          15

Val Val Thr Met Thr Ser Met Cys Gln Ala Val Gly Ser Asn Val Tyr
       20          25          30

Pro Leu Ile Leu Val Pro Gly Asn Gly Gly Asn Gln Leu Glu Val Arg
      35         40          45

Leu Asp Arg Glu Tyr Lys Pro Ser Ser Val Trp Cys Ser Ser Trp Leu
    50          55          60

Tyr Pro Ile His Lys Lys Ser Gly Gly Trp Phe Arg Leu Trp Phe Asp
 65          70          75          80

Ala Ala Val Leu Leu Ser Pro Phe Thr Arg Cys Phe Ser Asp Arg Met
        85         90          95

Met Leu Tyr Tyr Asp Pro Asp Leu Asp Asp Tyr Gln Asn Ala Pro Gly
       100        105       110

Val Gln Thr Arg Val Pro His Phe Gly Ser Thr Lys Ser Leu Leu Tyr
      115        120        125

Leu Asp Pro Arg Leu Arg Asp Ala Thr Ser Tyr Met Glu His Leu Val
     130        135        140

Lys Ala Leu Glu Lys Lys Cys Gly Tyr Val Asn Asp Gln Thr Ile Leu
145          150        155        160

Gly Ala Pro Tyr Asp Phe Arg Tyr Gly Leu Ala Ala Ser Gly His Pro
       165        170       175

Ser Arg Val Ala Ser Gln Phe Leu Gln Asp Leu Lys Gln Leu Val Glu
      180       185        190

Lys Thr Ser Ser Glu Asn Glu Gly Lys Pro Val Ile Leu Leu Ser His
      195       200       205

Ser Leu Gly Gly Leu Phe Val Leu His Phe Leu Asn Arg Thr Thr Pro
     210        215        220

Ser Trp Arg Arg Lys Tyr Ile Lys His Phe Val Ala Leu Ala Ala Pro

```
225                    230                    235                    240

Trp Gly Gly Thr Ile Ser Gln Met Lys Thr Phe Ala Ser Gly Asn Thr
                245                250                255

Leu Gly Val Pro Leu Val Asn Pro Leu Leu Val Arg Arg His Gln Arg
            260                265                270

Thr Ser Glu Ser Asn Gln Trp Leu Leu Pro Ser Thr Lys Val Phe His
            275                280                285

Asp Arg Thr Lys Pro Leu Val Val Thr Pro Gln Val Asn Tyr Thr Ala
        290                295                300

Tyr Glu Met Asp Arg Phe Phe Ala Asp Ile Gly Phe Ser Gln Gly Val
305                310                315                320

Val Pro Tyr Lys Thr Arg Val Leu Pro Leu Thr Glu Glu Leu Met Thr
                325                330                335

Pro Gly Val Pro Val Thr Cys Ile Tyr Gly Arg Gly Val Asp Thr Pro
            340                345                350

Glu Val Leu Met Tyr Gly Lys Gly Gly Phe Asp Lys Gln Pro Glu Ile
            355                360                365

Lys Tyr Gly Asp Gly Asp Gly Thr Val Asn Leu Ala Ser Leu Ala Ala
    370                375                380

Leu Lys Val Asp Ser Leu Asn Thr Val Glu Ile Asp Gly Val Ser His
385                390                395                400

Thr Ser Ile Leu Lys Asp Glu Ile Ala Leu Lys Glu Ile Met Lys Gln
            405                410                415

Ile Ser Ile Ile Asn Tyr Glu Leu Ala Asn Val Asn Ala Val Asn Glu
            420                425                430
```

```
<210> 15
<211> 552
<212> PRT
<213> Arabidopsis thaliana

<400> 15
Met Gly Ala Asn Ser Lys Ser Val Thr Ala Ser Phe Thr Val Ile Ala
  1            5                10                15

Val Phe Phe Leu Ile Cys Gly Gly Arg Thr Ala Val Glu Asp Glu Thr
                20                25                30

Glu Phe His Gly Asp Tyr Ser Lys Leu Ser Gly Ile Ile Ile Pro Gly
            35                40                45

Phe Ala Ser Thr Gln Leu Arg Ala Trp Ser Ile Leu Asp Cys Pro Tyr
        50                55                60
```

Thr Pro Leu Asp Phe Asn Pro Leu Asp Leu Val Trp Leu Asp Thr Thr
65          70          75              80

Lys Leu Leu Ser Ala Val Asn Cys Trp Phe Lys Cys Met Val Leu Asp
            85          90              95

Pro Tyr Asn Gln Thr Asp His Pro Glu Cys Lys Ser Arg Pro Asp Ser
            100         105             110

Gly Leu Ser Ala Ile Thr Glu Leu Asp Pro Gly Tyr Ile Thr Gly Pro
            115         120             125

Leu Ser Thr Val Trp Lys Glu Trp Leu Lys Trp Cys Val Glu Phe Gly
    130             135             140

Ile Glu Ala Asn Ala Ile Val Ala Val Pro Tyr Asp Trp Arg Leu Ser
145             150             155             160

Pro Thr Lys Leu Glu Glu Arg Asp Leu Tyr Phe His Lys Leu Lys Leu
            165             170             175

Thr Phe Glu Thr Ala Leu Lys Leu Arg Gly Gly Pro Ser Ile Val Phe
        180             185             190

Ala His Ser Met Gly Asn Asn Val Phe Arg Tyr Phe Leu Glu Trp Leu
        195             200             205

Arg Leu Glu Ile Ala Pro Lys His Tyr Leu Lys Trp Leu Asp Gln His
    210             215             220

Ile His Ala Tyr Phe Ala Val Gly Ala Pro Leu Leu Gly Ser Val Glu
225             230             235             240

Ala Ile Lys Ser Thr Leu Ser Gly Val Thr Phe Gly Leu Pro Val Ser
            245             250             255

Glu Gly Thr Ala Arg Leu Leu Ser Asn Ser Phe Ala Ser Ser Leu Trp
        260             265             270

Leu Met Pro Phe Ser Lys Asn Cys Lys Gly Asp Asn Thr Phe Trp Thr
        275             280             285

His Phe Ser Gly Gly Ala Ala Lys Lys Asp Lys Arg Val Tyr His Cys
    290             295             300

Asp Glu Glu Glu Tyr Gln Ser Lys Tyr Ser Gly Trp Pro Thr Asn Ile
305             310             315             320

Ile Asn Ile Glu Ile Pro Ser Thr Ser Ala Arg Glu Leu Ala Asp Gly
            325             330             335

Thr Leu Phe Lys Ala Ile Glu Asp Tyr Asp Pro Asp Ser Lys Arg Met
        340             345             350

Leu His Gln Leu Lys Lys Tyr Val Pro Phe Phe Val Ile Arg Asn Ile
    355             360             365

Ala His Arg Ser Ser Leu Ala Gly Phe Leu Leu Tyr His Asp Asp Pro
    370             375             380

```
Val Phe Asn Pro Leu Thr Pro Trp Glu Arg Pro Pro Ile Lys Asn Val
385             390         395             400

Phe Cys Ile Tyr Gly Ala His Leu Lys Thr Glu Val Gly Tyr Tyr Phe
                405             410             415

Ala Pro Ser Gly Lys Pro Tyr Pro Asp Asn Trp Ile Ile Thr Asp Ile
            420             425             430

Ile Tyr Glu Thr Glu Gly Ser Leu Val Ser Arg Ser Gly Thr Val Val
        435             440             445

Asp Gly Asn Ala Gly Pro Ile Thr Gly Asp Glu Thr Val Pro Tyr His
    450             455             460

Ser Leu Ser Trp Cys Lys Asn Trp Leu Gly Pro Lys Val Asn Ile Thr
465             470             475             480

Met Ala Pro Gln Ile Leu Ile Gly Lys Ile Lys Gln Gln Pro Glu His
            485             490             495

Asp Gly Ser Asp Val His Val Glu Leu Asn Val Asp His Glu His Gly
        500             505             510

Ser Asp Ile Ile Ala Asn Met Thr Lys Ala Pro Arg Val Lys Tyr Ile
        515             520             525

Thr Phe Tyr Glu Asp Ser Glu Ser Ile Pro Gly Lys Arg Thr Ala Val
    530             535             540

Trp Glu Leu Asp Lys Ser Gly Tyr
545             550
```

<210> 16
<211> 387
<212> PRT
<213> Arabidopsis thaliana

<400> 16

```
Val Gly Ser Asn Val Tyr Pro Leu Ile Leu Val Pro Gly Asn Gly Gly
  1             5               10              15

Asn Gln Leu Glu Val Arg Leu Asp Arg Glu Tyr Lys Pro Ser Ser Val
            20              25              30

Trp Cys Ser Ser Trp Leu Tyr Pro Ile His Lys Lys Ser Gly Gly Trp
        35              40              45

Phe Arg Leu Trp Phe Asp Ala Ala Val Leu Leu Ser Pro Phe Thr Arg
    50              55              60

Cys Phe Ser Asp Arg Met Met Leu Tyr Tyr Asp Pro Asp Leu Asp Asp
65              70              75              80

Tyr Gln Asn Ala Pro Gly Val Gln Thr Arg Val Pro His Phe Gly Ser
            85              90              95

Thr Lys Ser Leu Leu Tyr Leu Asp Pro Arg Leu Arg Asp Ala Thr Ser
```

```
              100                     105                     110

Tyr Met Glu His Leu Val Lys Ala Leu Glu Lys Lys Cys Gly Tyr Val
        115                 120                 125

Asn Asp Gln Thr Ile Leu Gly Ala Pro Tyr Asp Phe Arg Tyr Gly Leu
        130                 135                 140

Ala Ala Ser Gly His Pro Ser Arg Val Ala Ser Gln Phe Leu Gln Asp
145                 150                 155                 160

Leu Lys Gln Leu Val Glu Lys Thr Ser Ser Glu Asn Glu Gly Lys Pro
                165                 170                 175

Val Ile Leu Leu Ser His Ser Leu Gly Gly Leu Phe Val Leu His Phe
            180                 185                 190

Leu Asn Arg Thr Thr Pro Ser Trp Arg Arg Lys Tyr Ile Lys His Phe
            195                 200                 205

Val Ala Leu Ala Ala Pro Trp Gly Gly Thr Ile Ser Gln Met Lys Thr
    210                 215                 220

Phe Ala Ser Gly Asn Thr Leu Gly Val Pro Leu Val Asn Pro Leu Leu
225                 230                 235                 240

Val Arg Arg His Gln Arg Thr Ser Glu Ser Asn Gln Trp Leu Leu Pro
            245                 250                 255

Ser Thr Lys Val Phe His Asp Arg Thr Lys Pro Leu Val Val Thr Pro
            260                 265                 270

Gln Val Asn Tyr Thr Ala Tyr Glu Met Asp Arg Phe Phe Ala Asp Ile
            275                 280                 285

Gly Phe Ser Gln Gly Val Val Pro Tyr Lys Thr Arg Val Leu Pro Leu
    290                 295                 300

Thr Glu Glu Leu Met Thr Pro Gly Val Pro Val Thr Cys Ile Tyr Gly
305                 310                 315                 320

Arg Gly Val Asp Thr Pro Glu Val Leu Met Tyr Gly Lys Gly Gly Phe
                325                 330                 335

Asp Lys Gln Pro Glu Ile Lys Tyr Gly Asp Gly Asp Gly Thr Val Asn
            340                 345                 350

Leu Ala Ser Leu Ala Ala Leu Lys Val Asp Ser Leu Asn Thr Val Glu
            355                 360                 365

Ile Asp Gly Val Ser His Thr Ser Ile Leu Lys Asp Glu Ile Ala Leu
    370                 375                 380

Lys Glu Ile
385
```

<210> 17
<211> 389

<212> PRT
<213> Arabidopsis thaliana

<400> 17

```
Leu Lys Lys Glu Gly Leu Lys Ala Lys His Pro Val Val Phe Ile Pro
 1               5                  10                  15

Gly Ile Val Thr Gly Gly Leu Glu Leu Trp Glu Gly Lys Gln Cys Ala
                20                  25                  30

Asp Gly Leu Phe Arg Lys Arg Leu Trp Gly Gly Thr Phe Leu Cys Trp
            35                  40                  45

Val Glu His Met Ser Leu Asp Asn Glu Thr Gly Leu Asp Pro Ala Gly
        50                  55                  60

Ile Arg Val Arg Ala Val Ser Gly Leu Val Ala Ala Asp Tyr Phe Ala
65                  70                  75                  80

Pro Gly Tyr Phe Val Trp Ala Val Leu Ile Ala Asn Leu Ala His Ile
                85                  90                  95

Gly Tyr Glu Glu Lys Asn Met Tyr Met Ala Ala Tyr Asp Trp Arg Leu
            100                 105                 110

Ser Phe Gln Asn Thr Glu Arg Asp Gln Thr Leu Ser Arg Met Lys Ser
            115                 120                 125

Asn Ile Glu Leu Met Val Ser Thr Asn Gly Gly Lys Lys Ala Val Ile
            130                 135                 140

Val Pro His Ser Met Gly Val Leu Tyr Phe Leu His Phe Met Lys Trp
145                 150                 155                 160

Val Glu Ala Pro Ala Pro Leu Gly Gly Gly Gly Gly Pro Asp Trp Cys
                165                 170                 175

Ala Lys Tyr Ile Lys Ala Val Met Asn Ile Gly Gly Pro Phe Leu Gly
            180                 185                 190

Val Pro Lys Ala Val Ala Gly Leu Phe Ser Ala Glu Ala Lys Asp Met
            195                 200                 205

Arg Met Thr Arg Thr Trp Asp Ser Thr Met Ser Met Leu Pro Lys Gly
    210                 215                 220

Gly Asp Thr Ile Trp Gly Gly Leu Asp Trp Ser Pro Glu Leu Pro Asn
225                 230                 235                 240

Ala Pro Glu Met Glu Ile Tyr Ser Leu Tyr Gly Val Gly Ile Pro Thr
                245                 250                 255

Glu Arg Ala Tyr Val Tyr Lys Leu Asn Gln Ser Pro Asp Ser Cys Ile
            260                 265                 270

Pro Phe Gln Ile Phe Thr Ser Ala His Glu Glu Asp Glu Asp Ser Cys
            275                 280                 285
```

```
Leu Lys Ala Gly Val Tyr Asn Val Asp Gly Asp Glu Thr Val Pro Val
    290                 295             300
```

```
Leu Ser Ala Gly Tyr Met Cys Ala Lys Ala Trp Arg Gly Lys Thr Arg
305                 310             315                 320
```

```
Phe Asn Pro Ser Gly Ile Lys Thr Tyr Ile Arg Glu Tyr Asn His Ser
            325             330             335
```

```
Pro Pro Ala Asn Leu Leu Glu Gly Arg Gly Thr Gln Ser Gly Ala His
            340             345             350
```

```
Val Asp Ile Met Gly Asn Phe Ala Leu Ile Glu Asp Ile Met Arg Val
        355             360             365
```

```
Ala Ala Gly Gly Asn Gly Ser Asp Ile Gly His Asp Gln Val His Ser
    370             375             380
```

```
Gly Ile Phe Glu Trp
385
```

```
<210> 18
<211> 402
<212> DNA
<213> Arabidopsis thaliana
```

```
<220>
<221> CDS
<222> (120)..(401)
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```
<221> Unsure
<222> 1..401
<223> n is c, g, a, t or u.
```

```
<221> Unsure
<222> 1..401
<223> Xaa = unknown
```

```
<400> 18
```

```
agaaacagct ctttgtctct ctcgactgat ctaacaatcc ctaatctgtg ttctaaattc 60
```

```
ctggacgaga tttgacaaag tccgtatagc ttaacctggt ttaatttcaa gtgacagat 119
```

```
atg ccc ctt att cat cgg aaa aag ccg acg gag aaa cca tcg acg ccg   167
Met Pro Leu Ile His Arg Lys Lys Pro Thr Glu Lys Pro Ser Thr Pro
  1               5                  10                  15
```

```
cca tct gaa gag gtg gtg cac gat gag gat tcg caa aag aaa cca cac   215
Pro Ser Glu Glu Val Val His Asp Glu Asp Ser Gln Lys Lys Pro His
            20                  25                  30
```

```
gaa tct tcc aaa tcc cac cat aag naa tcg aac gga gga ggg aag tgg   263
Glu Ser Ser Lys Ser His His Lys Xaa Ser Asn Gly Gly Gly Lys Trp
        35                  40                  45
```

```
tcg tgc atc gat tct tgt tgt tgg ttc att ggg tgt gtg tgt gta acc   311
Ser Cys Ile Asp Ser Cys Cys Trp Phe Ile Gly Cys Val Cys Val Thr
      50                  55                  60
```

```
tgg tgg ttt ctt ctc ttc ctt tac aac gca atg cct gcg agc ttc cct    359
Trp Trp Phe Leu Leu Phe Leu Tyr Asn Ala Met Pro Ala Ser Phe Pro
 65                  70              75                      80

cag tat gta acg gag ccg aat cac gng tcc ttt gcc tta ccc g          402
Gln Tyr Val Thr Glu Pro Asn His Xaa Ser Phe Ala Leu Pro
                85                  90
```

<210> 19
<211> 516
<212> DNA
<213> Neurospora crassa

<220>
<221> Unsure
<222> 1..516
<223> n is g, c, a, t, or u.

<400> 19

```
ggtggcgaag acganggcgg aagttggagg ctaacgagaa tgacnctcgg agatggatct  60
accctctaga gacacgacta ccnttgcacc cagcctcaag gtntacngtt tntatgggta 120
ggaagccgac ggagcgagcc tacatctatc tggcgcccga tcccgggacg acaacgcatc 180
tttagatgac gatcgatacg actttgactn aggggcacat tgaccacggt gtgattttgg 240
gcgaaggcga tggcacagtg aaccttatga gtttggggta cctgtgcaat aaggggtgga 300
aaatgaagag atacaatcct gcgggctcaa aaataaccgt ggtcgagatg ccgcatgaac 360
cagaacggtt caatccgaga ggagggccga atacggcgga cttaaatatg tagaaaaggt 420
tgaaatttat gaagagtaat taaatacggc acataggtta ctcaatagta tgactaatta 480
aaaaaaaatt tttttctaa aaaaaaaaaa aaaaaa                            516
```